

Remarks

Reconsideration of this Application is respectfully requested.

Upon entry of the foregoing amendments, claims 1, 2, 4, and 6-11 are pending in the application, with claims 1, 10 and 11 being the independent claims. Claims 3 and 5 were previously cancelled without prejudice to or disclaimer of the subject matter therein. New claims 10 and 11 are sought to be added. Support for the amendment can be found throughout the application, e.g., pg. ____, ll. _____. These changes are believed to introduce no new matter, and their entry is respectfully requested.

Based on the above amendments and the following remarks, Applicants respectfully request that the Examiner reconsider all outstanding objections and rejections and that they be withdrawn.

Interview Summary

Applicants thank the Examiner for conducting the Examiner Interview on January 26, 2009. Applicants' representative sincerely thanks the Examiner for his thoughtful consideration of Applicants' position during the interview.

During the interview, several features of claim 1 were discussed. Applicants' representative emphasized that claim 1 features an extended sonication period (i.e., for 2-10 hours) which aids in functionalizing the carbon nanotubes, resulting bond formation with the water-soluble salt. Also discussed was the claim 1 phrase "wherein the dispersion medium is selected from the group consisting of"

Rejections of claims 1-2, 4 and 6-9 under 35 U.S.C. § 103(a)

Claims 1-7 and 9 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Hwang *et al.* (*J. Mater. Chem.* 11:1722-1725 (2001)) in view of Smalley *et al.* (*J. Nanosci. Nanotech* 3:81-86 (2003)). Specifically, the Examiner alleged that Hwang describes a process for forming a carbon nanotube reinforced ceramic nanocomposite by sonication of the CNT solution for 10 minutes. The Examiner acknowledged that Hwang does not provide for an extended sonication period of 2 to 10 hours. The Examiner alleged that Hwang teaches that a stable and homogenous suspension is critical, and that said suspension is achieved through the sonication step. For evidence of this allegation, the Examiner alleged that Smalley describes the relationship between sonication time and CNT dispersion for time periods up to 5 hours. Applicants respectfully traverse.

Claim 1 is the independent claim. Claims 2-7 and 9 are dependent on claim 1.

A. Hwang does not describe the dispersion medium as featured in Claim 1.

Claim 1 recites a method of producing ceramic nanocomposite powder utilizing a dispersion medium, wherein the dispersion medium is selected from the group consisting of water, ethanol, nitric acid solution, toluene, N,N-dimethylformamide, dichlorocarbene, and thionyl chloride. Hwang does not teach a dispersion medium as recited in claim 1. Rather, Hwang uses a detergent solution of 1.2 mM cetyltrimethylammonium bromide aqueous solution. See, Hwang, pg. 1722, col. 1, last ¶. The use of a detergent solution is not one of the enumerated dispersion medium listed in claim 1. Thus, Hwang does not teach the element of "dispersion medium" as recited in claim 1.

The Examiner has previously taken the position that claim 1 does not preclude the possibility of adding a detergent, as evidenced by the phrase "*consisting essentially of* the carbon nanotubes, the water-soluble salt, and the dispersion medium, . . ." However, Applicants respectfully remind the Examiner that the phrase "consisting essentially of" does not abrogate the claim limitation of the enumerated dispersion medium. In other words, the phrase "dispersion medium is selected from the group consisting of" is a closed phrase, thereby precluding a detergent solution as a dispersion medium. If the Examiner considers the detergent medium to be something other than a dispersion medium, the Examiner is invited to clarify to Applicants what he believes is the dispersion medium of Hwang.

Likewise, Smalley also teaches the use of surfactants as a dispersion medium, and does not utilize any of the recited dispersion medium of claim 1. Thus, Smalley does not cure the deficiencies of Hwang.

Since neither Hwang nor Smalley teach or suggest the dispersion medium as recited in claim 1, each and every element of claim 1 cannot be found in Hwang and Smalley, either individually or collectively. For at least this reason, Applicants respectfully request that the rejection of claims 1-2, 4 and 6-9 under 35 U.S.C. §103(a) be withdrawn.

B. Hwang does not describe a dispersion consisting essentially of carbon nanotubes, water soluble salts, and the dispersion medium.

Claim 1 recites a method of producing ceramic nanocomposite powder, the method comprising sonicating a dispersion for 2 to 10 hours, the dispersion *consisting*

essentially of the carbon nanotubes, the water soluble salt, and the dispersion medium a dispersion medium. The Examiner stated

That is, the Examiner can construe no reason to suggest that incorporation of the C₁₆TAB surfactant or quaternary ammonium salt as a component of the water soluble salt "including" the named metal-based salt would in any matter violate the basic and novel characteristics of the claimed invention or that the C₁₆TAB component should otherwise be excluded from the claimed composition.

Office Action, pg. 7, ll. 3-8.

The Examiner's attention is directed to the case law cited by the Examiner on page 6, l. 10 of the Office Action: *In re Herz*, 537 F.2d 549 (CCPA 1976). *In re Herz* states that the term "consisting essentially of" limits the scope of the claim to the specific materials or steps that do not materially affect the basic and novel characteristics of the invention. *Id.*, pg 551-552. The basic and novel characteristics of the present invention can be found in the application as filed. Some of the characteristics have been previously highlighted by Applicants in the previously filed Amendment and Replies, and are recited in claim 1, i.e., formation of the nanocomposite powder using a (i) specific dispersion medium, (ii) sonicating for 2-10 hours, (iii) to homogeneously disperse the carbon nanotubes, and (iv) form chemical bonds between the carbon nanotubes and the ceramic matrix.

Applicants submit that the addition of detergent to the dispersion would materially affect the basic and novel characteristics of the invention. Namely, the addition of detergents would alter the dispersion medium since the detergent would form micelles around the carbon nanotubes in the dispersion medium. Detergent-encapsulated carbon nanotubes would exist with reduced, if any, contact with the dispersion medium, thereby reducing the formation of chemical bonds between the functionalized carbon

nanotubes and the water-soluble salts during the extended sonication. This was highlighted in Smalley *et al.*, pg. 85, 1st col. Thus, the basic and novel characteristics of the invention would be altered by the addition of the detergent. In accordance with *In re Herz*, Applicants have highlighted some of the basic and novel characteristics of the invention, and have demonstrated how addition of a detergent would materially affect these characteristics by noting the basic scientific principles of detergent micelles. Therefore, Applicants submit that the term "the dispersion consisting essentially of" precludes the inclusion of a detergent, since a detergent would alter the basic and novel characteristic of the invention.

For at least this reason, Applicants respectfully request that the rejection of claims 1-2, 4 and 6-9 under 35 U.S.C. §103(a) be withdrawn.

Other Matters

The Examiner's attention is direct to new claims 10 and 11. Claim 10 is similar to claim 1, but recites the phrase in (d) "to functionalize the carbon nanotubes." This new feature requires the functionalizing of the carbon nanotubes during the sonication of the dispersion of (c). Claim 10 further distinguishes Hwang and Smalley, since neither Hwang or Smalley utilize the combination of the claimed dispersion medium and the extended sonication period used for functionalizing the carbon nanotubes.

Claim 11 is also similar to claim 1, but limits claim 1 further by reciting the phrases "consisting of" instead of "includes" in (c), and also recites the phrase "consisting of" instead of "consisting essentially of" in (d). Claim 11 further

distinguishes Hwang and Smalley, since it precludes the addition of detergent to either the metal-based salts of (c), or the dispersion of (d).

Applicants respectfully request consideration of these new claims.

Conclusion

All of the stated grounds of objection and rejection have been properly traversed, accommodated, or rendered moot. Applicants therefore respectfully request that the Examiner reconsider all presently outstanding objections and rejections and that they be withdrawn. Applicants believe that a full and complete reply has been made to the outstanding Office Action and, as such, the present application is in condition for allowance. If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

Prompt and favorable consideration of this Amendment and Reply is respectfully requested.

Respectfully submitted,

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